Raymark Bulletin #40

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EPA Continues Evaluation of Soil Gas, Indoor Air and Groundwater

This fact sheet provides information on a phase of soil gas, indoor air and GW investigation that EPA will conduct in the Stratford Housatonic River/Ferry Creek area. The fieldwork will be conducted in two steps. The first step will occur during the last week of March 2003. The second step is planned to occur during the first week of May 2003. These steps are described below.

Introduction

EPA has conducted soil gas and indoor air sampling in Stratford over the past three years. Soil gas is a term describing gas that fills the tiny voids between soil particles. When groundwater is contaminated with VOCs (chemical compounds that evaporate readily to the atmosphere), the chemicals can change into a gas and move upward in the soil and into homes and buildings. Previous sampling has confirmed that this is occurring in some areas and EPA and the Connecticut Department of Environmental Protection (CT DEP) have installed ventilation systems in nine building where contaminant levels were high enough to cause a concern for human health exposure. The VOCs that were detected in indoor air samples were 1,1-dichloroethylene (1,1-DCE), trichloroethylene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), and toluene.

EPA has been investigating the groundwater in Stratford for a number of years. The focus of the investigation has only recently narrowed to the area of contamination between the former Raymark facility and the Housatonic River/Ferry Creek area. This will again be the focus area for the work described here.

Soil Gas, Indoor Air and Groundwater Investigation

Why?

This work is being proposed because the continuing rounds of sampling have indicated that VOCs in groundwater are moving into the indoor air in some homes. This additional sampling is being conducted to further identify those homes and areas that may have exposure to contaminated vapors.

When?

The work is planned to be conducted in two steps. The first step is planned to occur during the last week of March 2003. The second step is planned to occur during the first week of May 2003.

What's the problem?

Indoor air and soil gas testing was conducted in 2000, 2001, and 2002. EPA found site-related contaminants in some yards and indoor locations sampled. Details of the sampling efforts are discussed in Raymark Bulletins #34, #35 and #37 which are available at the Stratford Library and online at the EPA website (see last page for web address). Additional investigation of these contaminants and their potential impacts on homes/buildings is prudent to ensure protection of public health.

Where and how will this be done?

- **Step One.** The first step will entail detailed and comprehensive indoor air and soil gas testing at a number of homes in or near areas where groundwater information suggests indoor air impacts could be occurring. EPA will contact each homeowner to request access

- to the home for sampling, to further describe the tests that will be conducted in the home, to explain why the testing is important and the expected duration of the testing.

- **Step Two.** The second step will entail discrete and focused soil gas and groundwater testing outside near select groundwater monitoring wells. The purpose of the testing will be to better understand the relationship between groundwater VOC concentrations and soil vapor concentrations. This step will not require access to homes.

Specific Details for Step One: Indoor Air and Soil Gas Testing at Select Homes

The ability for EPA to assess potential impacts at homes located in areas in or near VOC-contaminated groundwater depends upon each homeowner. If provided access to a given home, EPA will be prepared to conduct the tests described below. All information and data collected will be kept confidential and shared only with each homeowner, the CT Department of Environmental Protection and the state and local health departments.

1. Indoor Air

A. **Radon measurements.** The problem of the migration of VOCs from groundwater to indoor air (collectively termed, the "vapor intrusion pathway") is similar in many respects to the migration of radon into a home. Radon, however, has little if any of the "background" or "interference" problems that a VOC measurement can have (for instance, a can of paint or new carpet can 'confuse' a VOC measurement). Also, radon is easy to measure. The radon measurement can be compared to the VOC measurements and other measurements to more precisely determine the amount and the rate of VOC migration into the home, if any. There are two types of radon measurements:

Passive. Passive radon measurements are time-weighted measurements. For this measurement, EPA simply places radon collectors (small carbon canisters) in each home; typically, in the basement and on the first floor (they may also be placed in unique areas of the home such as crawl spaces (if any)). At this time, EPA will collect some basic information about the home (e.g., dimensions and general layout of the basement and first floor, etc.). The canisters are then simply left alone to 'equilibrate' for about 48 hours. When EPA returns, the canisters are collected and shipped to a laboratory for analysis. *This measurement is one of the first measurements EPA will make and it is necessary that it occur about 48 hours before additional measurements occur. A table is provided below to help each homeowner understand the sequence, and approximate timing and duration of measurement activities that EPA would conduct in each home.*

Active. Active radon measurements are instantaneous "grab" samples. On the day that EPA is allowed access the home, a sample of air will be collected in a canister specifically designed for radon. The active radon canister will then be transported to a radon lab for analysis.

B. **Indoor Air Exchange Rate Measurements** these measurements are similar to the passive radon canister measurements in that very simple and small (approx. 1/4" in diameter by 3" in length) passive measurement tubes will be placed in and around the basement, first floor and possibly the second floor of the home, and allowed to equilibrate for at least 24 hours. The purpose of these measurements is

to calculate and understand the average rate of movement of air through the house, the 'respiration' of the house with the outdoors, and how air may move into the home from the soil under the home. *This measurement is like the passive radon measurement: it is one of the first measurements EPA will make and it is necessary that it occur at least 24 hours before other measurements occur. It will occur in 2 separate "parts" or steps.*

C. VOC Measurements Indoor air will be sampled for VOCs using a Summa canister method similar to the measurements that EPA has already conducted at a number of homes in the Housatonic River/Ferry Creek area. The previous measurements, however, were generally conducted for about 8 hours. These measurements will take 24 hours in order to provide a better average concentration of VOCs, if any, in the home. The reason why a 24 hour average measurement is more precise than an 8 hour measurement is because each home 'breathes' in 24 hour cycles, called "diurnal periods." The home actually breathes the 'heaviest' in the early morning hours, and it is this period that EPA is interested in measuring for purposes of a time-weighted average VOC measurement. *This measurement is similar to the passive radon measurement in that it is one of the first measurements EPA will make and it is necessary that it occur at least 24 hours before other measurements occur.*

D. Additional Indoor Air Measurements. For those homes that can allow EPA access over the course of a day, EPA will take periodic radon and indoor air exchange rate measurements over an approximate 8 hour day. For these periodic measurements, an EPA technician will be present in the basement of the home for approximately 8 hours during the day. The technician may request to leave a measurement instrument in the home overnight. The measurements would be very similar to those already described except that they would be instantaneous ("grab") measurements as opposed to time-weighted measurements. The purpose of these periodic instantaneous measurements would be to confirm and enhance the information provided by the passive ("time-weighted") measurements.

2. Soil Gas: Subslab and VOC Measurements.

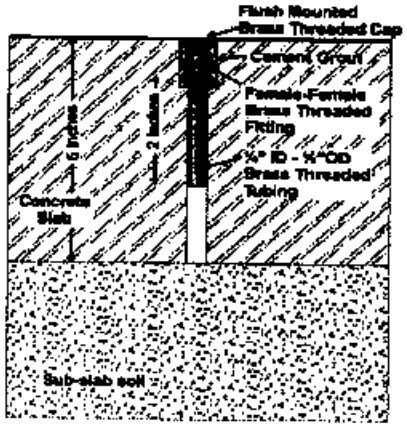
It is also important to measure the soil gas under each home. VOCs that migrate from groundwater 'collect' under home and building foundations. For a variety of reasons, soil vapor measurements conducted outside of the home may not accurately or precisely measure the amount of VOCs in the soil vapor that may be present (if any) and entering the home.

For these subslab measurements, EPA will drill three (3) to five (5) small (approx. 1/4" in diameter) holes through the basement of each home to install small sampling ports for collecting instantaneous "grab" samples of the soil gas under each home. The ports will be finished so that the top of the port is flush with the floor surface. The same sample ports can be used for both radon and VOC measurements. If the homeowner desires, the sampling ports can be removed after sampling. However, if EPA determines and the homeowner agrees that the installation of a subslab basement ventilation system is appropriate, the sample ports could be useful in designing a ventilation system for the homeowner. EPA requests the homeowner take this into account.

To help the homeowner understand what each sampling port will look like, the figures below illustrate the actual size and construction of the sampling port. In Figure 1, the size of the hole in the basement floor is compared to the size of a quarter. Figure 2 provides a conceptual view of the sampling probe. For those homes that may have carpeting in the basement, the carpeting may be lifted or otherwise moved out of the way and then replaced over the probes when EPA concludes its tests; or a very small and neat ½ of a square "flap" could be cut in the carpeting. After installation and sampling of the probes, this "flap" can be sewn, glued or taped down thereby returning the rug to its original appearance.

Figure 1

Figure 2



Who is EPA's Office of Research and Development (ORD) and why is ORD involved?
EPA has a number of laboratories across the United States. These laboratories are staffed by experts in environmental science. EPA's ORD routinely provides technical support to EPA projects such as the Raymark Stratford, CT site. The migration of VOCs from groundwater to indoor air is complex. EPA believes that ORD technical support would be helpful in understanding the potential impacts of VOCs on homes and buildings in the Housatonic River/Ferry Creek area. Two EPA laboratories will be involved with this work: (1) EPA's National Risk Management Research Lab, Subsurface Protection and Remediation Division, located in Ada, Oklahoma and (2) EPA's National Risk Management Research Lab, Indoor Environment Management Branch located at the Research Triangle Park, North Carolina. The Ada, Oklahoma lab specializes in the sciences of the subsurface (soils and groundwater) and the Research Triangle Park lab specializes in radon and indoor air science.

Sequence, Duration and Timing of Step One Measurements

For homeowners that allow EPA to take measurements in their homes, the following schedule shows the approximate sequence and timing of events.

Visit #	*Measurement*	*Duration*	*Sequence*
1	Deploy Passive Radon Samplers and Part 1 of Air Exchange Sampler	1 hour	Initial Visit
2	Deploy Part 2 of Air Exchange Sampler and Collect Passive Radon Sampler	1 hour	48 hours following Initial Visit
3	Collect Air Exchange Samplers, Install Subslab Sampling Ports and Begin Indoor Air VOC Sampling	~ 2 hours	24 Hours following Visit #2
4	Sample Sub-slab Sampling Ports and Conduct Additional Indoor Air Tests*	~2-24 hours	24 Hours following Visit #3

Sequence Explained. The provided sequence indicates the general progression of the measurements. Some measurements may occur simultaneously or at different times than presented. For instance, Indoor Air VOC Sampling in Visit #3 could possibly be performed during Visit #2.

* The additional indoor air tests do not need to be conducted at each home. EPA will request access to conduct these tests with each homeowner individually. The 24 hour time frame corresponds to the length of time and instrument will be in the home over night. This instrument runs automatically, does not make noise and can be placed in a convenient location out of the way in the basement of the home. EPA would then simply come to pick up the instrument the next day.

Who should you contact for more information?

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EPA New England website for past Raymark Bulletins:
www.epa.gov/region01/superfund/sites/raymark/bulletin